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INSTALLATION RESTORATION PHASE 2 CONFIRMATION QUANTIFICATION STAGE 2  
WORK PLAN ADDENDUM NAS FORT WORTH TX  
3/1/1990  
RADIAN CORPORATION

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**NAVAL AIR STATION  
FORT WORTH JRB  
CARSWELL FIELD  
TEXAS**

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**ADMINISTRATIVE RECORD  
COVER SHEET**

AR File Number 46



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INSTALLATION RESTORATION PROGRAM  
PHASE II - CONFIRMATION/QUANTIFICATION  
STAGE 2  
CARSWELL AIR FORCE BASE  
WORK PLAN ADDENDUM

MARCH 1990

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## A.0 INTRODUCTION

This Work Plan Addendum provides guidance for accomplishing those tasks required by the Carswell AFB IRP Phase II Stage 2 Modification 0004 Statement of Work that were either 1) not addressed in the Stage 2 Work Plan dated January 1988; or 2) were revised by the Schedule of Changes for the current effort. Unless otherwise indicated, all procedures/protocols documented in the approved Stage 2 Work Plan (January 1988) for tasks common to the previous Stage 2 effort and those tasks required in Modification 0004 (Mod 4) remain in effect.

## A.1 COMBINED SITE INVESTIGATION

A combined site investigation of the Flightline Area (Sites 4, 5, 10 and 12) will be performed. The results of this investigation will be presented in a site characterization report (see Section A.7) that describes the Flightline Area in terms of contaminant source(s), extent of Upper Zone contamination, and impacts of the contaminant plume(s) on Carswell AFB. Figure A-1 shows the approximate locations of soil borings, monitor wells, a pump test well, and surface water sampling points in the Flightline Area.

## A.2 SUBSURFACE SOIL SURVEYS

Up to 38 boreholes will be drilled using the hollow-stem auger (HSA) technique at the sites indicated in Table A-1. As many as 17 of the boreholes will be converted to monitoring wells (Table A-1). One large-diameter borehole will be drilled by HSA for construction of a six-inch diameter pump test well.

Soil samples from boreholes will be obtained as continuous cores in five-foot sections. Cores will be screened for evidence of organic contamination with an HNu or equivalent organic vapor detector, and will be logged lithologically using the IRPIMS Data Collection Forms (provided separately). A major objective of the soil boring program is to delineate the paleochannel

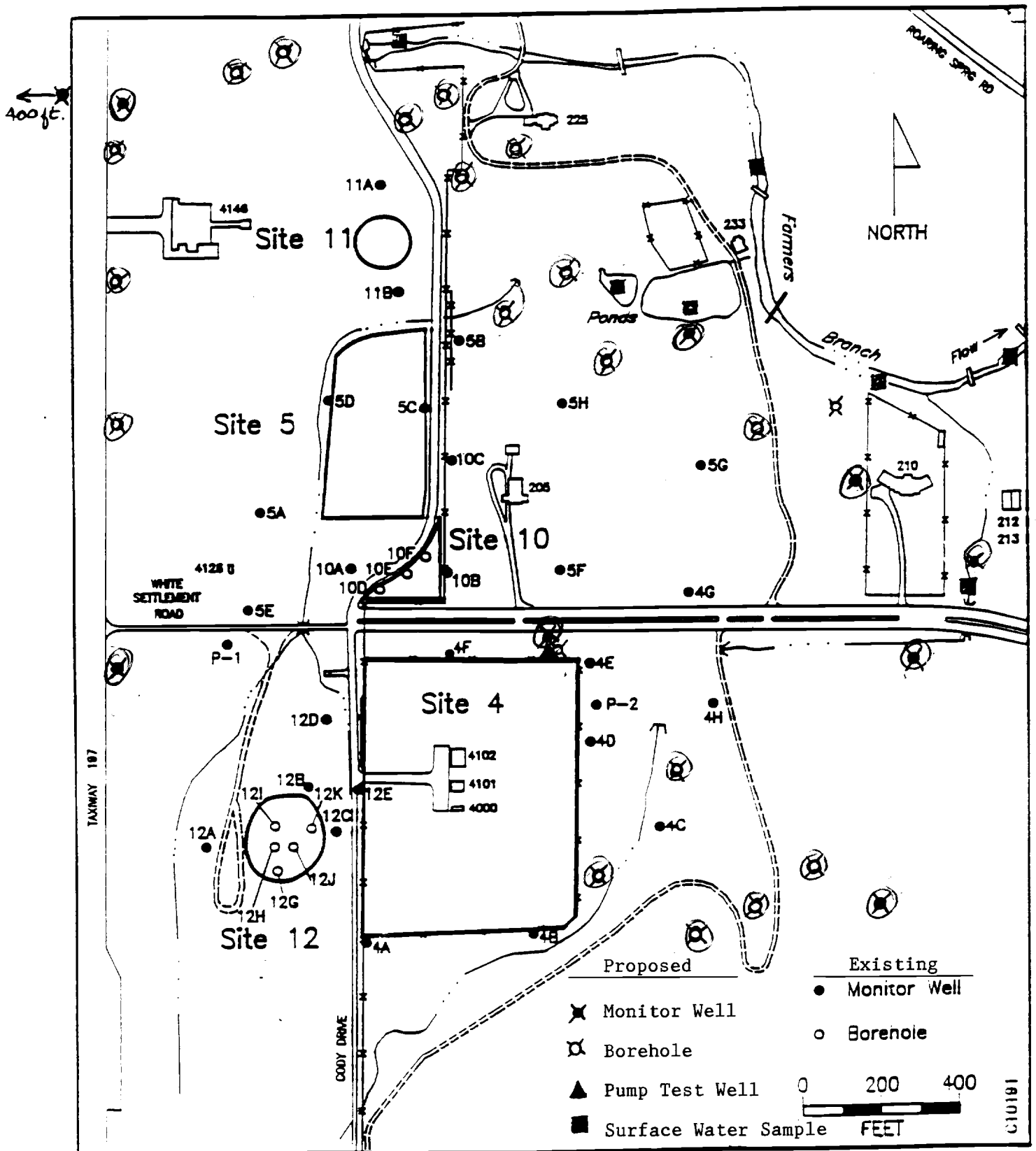


Figure A-1. Locations of Proposed (and Existing) RI/FS Stage 2 Activities and Sampling Points, Carswell AFB, Flightline Area

TABLE A-1. FIELD WORK SUMMARY, CARSWELL AFB, IRP PHASE II STAGE 2, MOD 4

Site	1	4	5	10	12	16	17	BSS	Total
Boreholes (#)	--	15 <sup>c</sup>	15 <sup>c</sup>	--	--	4 <sup>b</sup>	4 <sup>b</sup>	--	38
Borehole Depth (max. ft)	--	600	600	--	--	80	80	--	1360
UZ Wells (#)	--	5	5	--	--	4	4	--	18
Well Depth (max. ft)	--	200	200	--	--	80	80	--	560
Surf. Water Smpl. Rds.	--	--	1	--	--	1	--	--	1
Surf. Water Smpl. Pts.	--	--	7	--	--	4	--	--	11
Surf. Water Smpls. (#) <sup>a</sup>	--	--	7	--	--	4	--	--	11
GW Smpl. Rds.	1	1	1	1	1	1	1	1	1
GW Smpl. Pts.	6	13	14	3	5	4	9	3	57
GW Smpls (#) <sup>a</sup>	6	13	14	3	5	4	9	3	57
Aquifer Pump Test (Days)	--	3	--	--	--	--	--	--	3

<sup>a</sup>Does not include QC samples; see Table A-2.<sup>b</sup>All boreholes at Sites 16 and 17 will be converted to monitor wells.<sup>c</sup>Five of the boreholes at Sites 4 and 5 will be converted to wells.

features suggested in previous efforts. These highly permeable channel deposits may act as preferential pathways for migration of contaminants in ground water.

Up to 100 photographs of the cores may be taken. No core samples will be retained after logging (and photographing, if appropriate). Cores that exhibit evidence of contamination will be drummed for subsequent proper disposal by the base. No soil toxicity analysis requirements were retained in the Statement of Work for Mod 4. The locations and surface elevations of all soil borings will be professionally surveyed to the specification required in the Stage 2 Work Plan (January 1988).

#### A.3 WELL CONSTRUCTION

Monitor well construction materials for the current effort are the same as those specified in the Stage 2 Work Plan (January 1988). New monitor wells installed in the Flightline Area (nine total) however will be screened across the basal section of the Upper Zone Aquifer (normally the lower 10 feet). Depending on the saturated thickness of the Upper Zone, some wells may not intercept the water table. This monitor well design modification was made because trichloroethylene (TCE), a compound that tends to sink in water, is the primary organic contaminant of concern in the Flightline Area. Also, by comparing organic and inorganic contaminant concentrations in samples from existing water table wells with those from the new wells, contaminant concentration profiles and vertical hydraulic gradients in the Upper Zone can be evaluated. Individual well locations may be refined in the field by the Radian Supervising Geologist, upon concurrence of the HSD/YAQI Consulting Hydrogeologist, to target the channel deposits determined from the soil borings.

Four monitor wells each will be installed at Sites 16 and 17 (see Figures A-2 and A-3). These wells will be drilled and sampled continuously, as previously described, to an average depth of 20 feet (total drilled depth

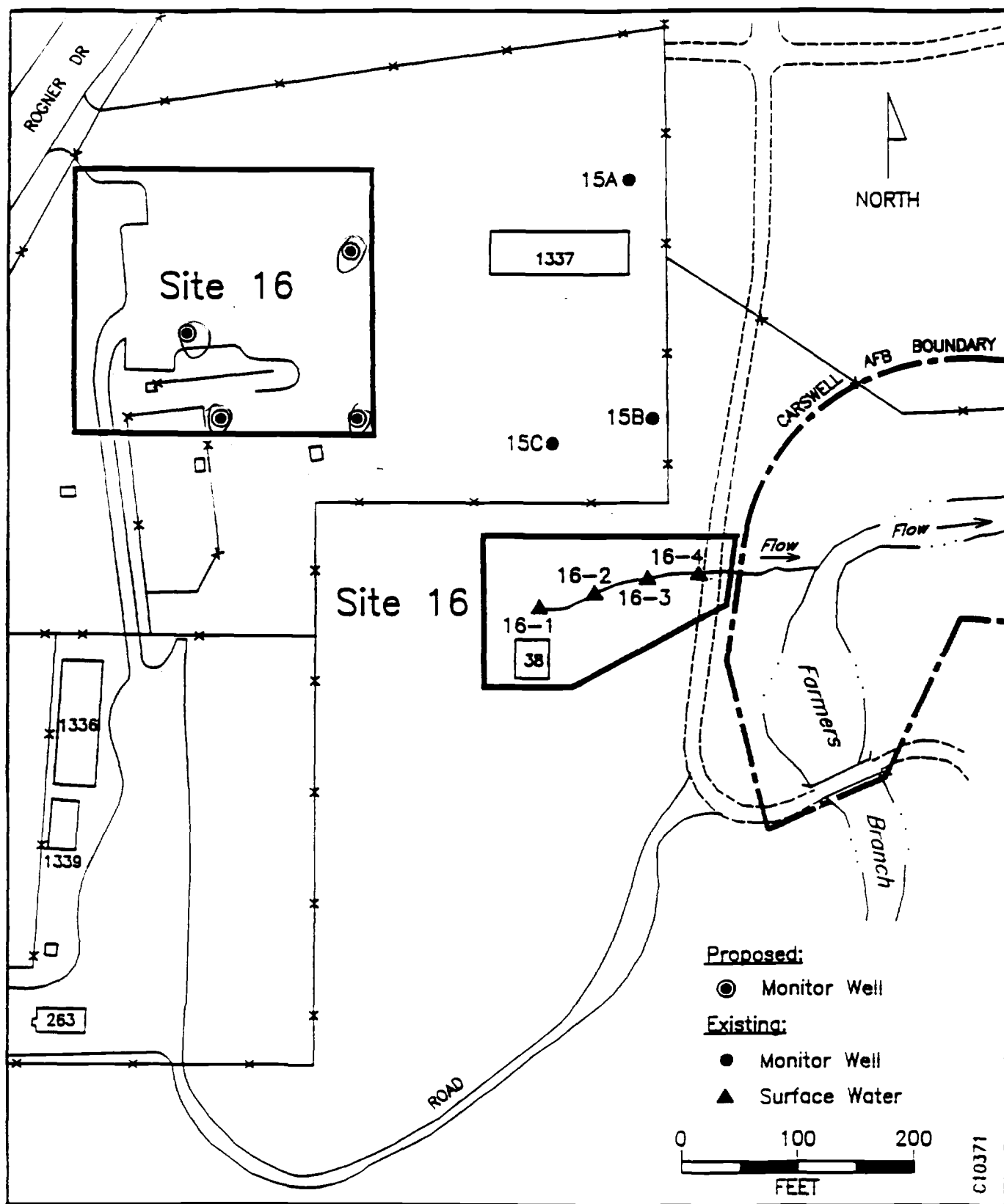


Figure A-2. Locations of Proposed (and Existing) RI/FS Stage 2 Activities and Sampling Points, Carswell AFB, Site 16, Unnamed Stream



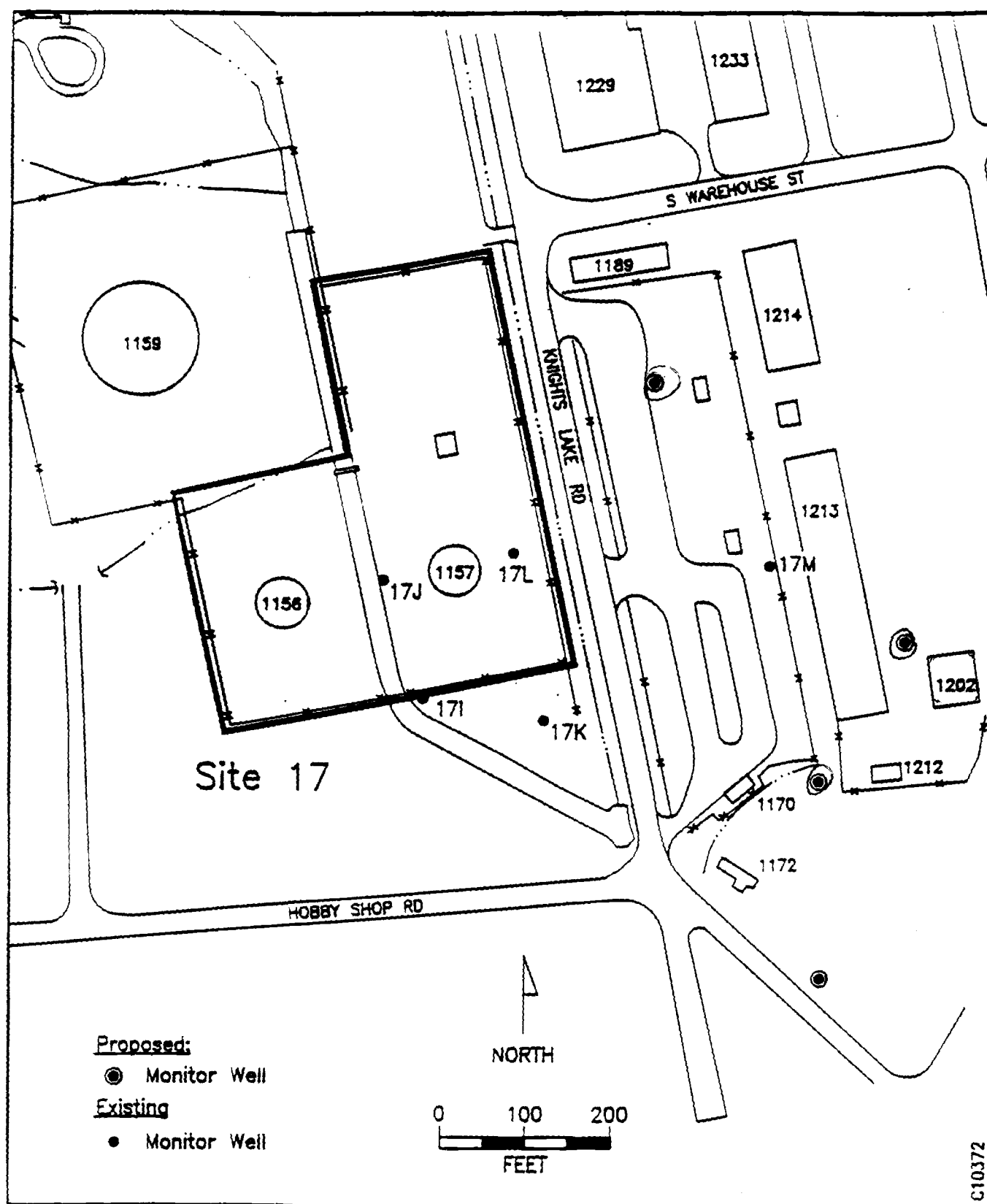


Figure A-3. Locations of Proposed (and Existing) RI/FS Stage 2 Activities and Sampling Points, Carswell AFB, Site 17, POL Tank Farm

not to exceed 160 linear feet). The wells will be screened to intercept the water table (Stage 2 Work Plan, January 1988).

One six-inch diameter well will be installed at the approximate location shown on Figure A-1 to perform a 24-hour pump test. A pilot boring will be drilled and continuously cored, then re-entered and reamed with large-diameter augers to allow installation of the pump test well. The well will be constructed of Schedule 80 PVC and will be screened over the entire saturated thickness of the Upper Zone (slot size 0.020 inches). A description of the pump test procedure is provided in Section A.6.

The type of well completion required (i.e., flush or stick-up with protective casing and guard posts) will be specified by the base POC, Mr. Frank Grey. Mr. Grey will also specify the identification numbers for the new wells and will obtain base clearances/permits for all drilling locations (previously staked).

The locations and elevations of the wells will be professionally surveyed as required in the Stage 2 Work Plan (January 1988).

#### A.4 WATER LEVEL SURVEY

One staff gauge will be installed at a location on Farmers Branch (to be determined jointly by the HSD/YAQI Consulting Hydrogeologist, Mr. Karl Ratzlaff and the Radian supervising geologist). The horizontal location and elevation of the staff gauge will be professionally surveyed to an accuracy of  $\pm 0.01$  foot vertical and  $\pm 1$  foot horizontal. The synoptic water level survey of Upper Zone ground water in monitor wells at Sites 4, 5, 10, and 12; and surface water in Farmers Branch at the staff gauge will be performed.

#### A.5 WATER SAMPLING AND ANALYSIS

One round of ground-water and surface water samples will be collected as indicated in Table A-1. Monitor wells and surface water sampling

points are shown on Figures A-1, A-2, and A-3. Sampling procedures will be as described in the Stage 2 Work Plan (January 1988). Table A-2 indicates the number and types of required analyses by site, as well as the number and type of field QC samples. Note that two aliquots will be collected from each well for analysis of metals. One of the samples will be unfiltered and the other will be filtered at the well head using a 0.45  $\mu\text{m}$  filter with millipore pump and portable generator prior to pH adjustment.

#### A.6 UPPER ZONE PUMP TEST

An aquifer pump test will be performed to evaluate the hydraulic characteristics of the Upper Zone deposits in the Flightline Area. The pump test will involve several wells, with one six-inch diameter well being pumped, and several others being monitored. Figure A-4 shows a generalized cross sectional view of a typical pump test battery of wells.

Pump tests usually provide the means to stress an aquifer to such a degree that reliable estimates of transmissivity, storativity and hydraulic conductivity can be made. These values can be calculated by observing the drawdown and recovery of the pumping well and observation wells. Each of these parameters will help to define the nature of ground-water contaminant plume migration.

The proposed site for the aquifer test pumping well is immediately outside the northern perimeter of Site 4 approximately 100 feet west of existing monitor well 4E. A six-inch diameter well screened in the Upper Zone will be installed as the pumping well. A two-inch diameter observation (monitor) well will be installed within 50 feet of the pump test well. It is anticipated that several existing wells in the vicinity of the pumping well (4#, 4F, 5F, and potentially others) will be monitored either electronically or by hand. The number of wells monitored during the test will depend upon the lateral extent of the pumping effect on the Upper Zone. A duration of 24 hours is proposed for the test.

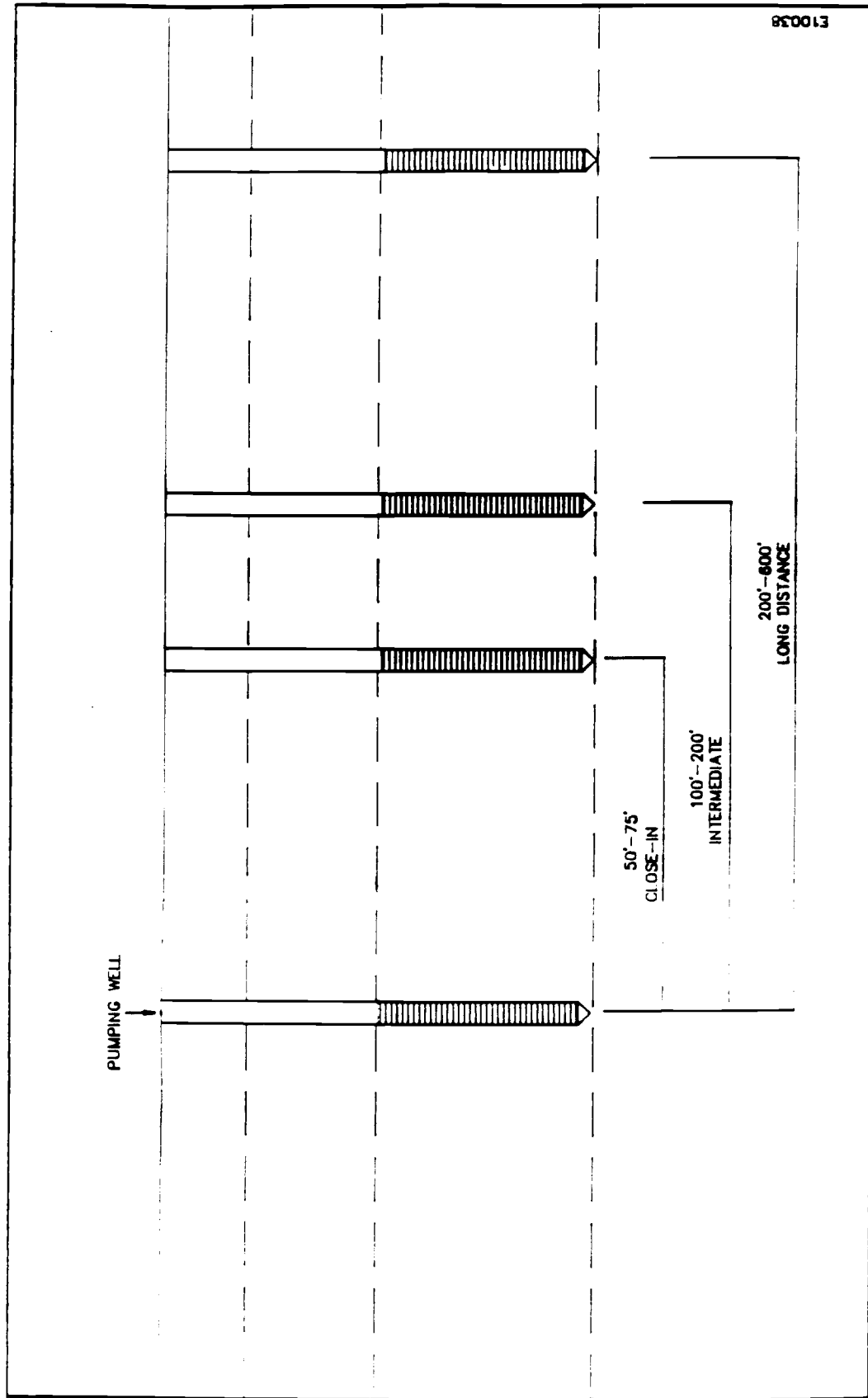


Figure A-4. Generalized Cross Section View of Typical Pumping Test Well Battery

TABLE A-2. REQUIRED ANALYSES, BY SITE

Parameter	Method	Site							Field QC Samples				
		1	4	5	10	12	16	17	BSS	Trip Blanks	Amb. Cond. Blanks	Equip. Blanks	Dups
Alkalinity (Field Test)	A 403	6	13	21	3	5	8	9	3	--	--	7	7
Fluoride	E 340.2	6	13	21	3	5	8	9	3	--	--	7	7
Chloride	E 325.3	6	13	21	3	5	8	9	3	--	--	7	7
Nitrate	E 353.1	6	13	21	3	5	8	9	3	--	--	7	7
Orthophosphate	E 365.1	6	13	21	3	5	8	9	3	--	--	7	7
Sulfate	E 375.4	6	13	21	3	5	8	9	3	--	--	7	7
TDS	E 160.1	6	13	21	3	5	8	9	3	--	--	--	7
Metals *													
Total Recoverable		6	13	21	3	5	8	9	3	--	--	7	7
Dissolved		6	13	21	3	5	8	9	3	--	--	7	7
Petroleum	E 418.1	--	--	--	--	5	8	9	3	--	--	3	3
Hydrocarbons													
Purgeable	E 501	6	13	21	3	5	8	9	3	**	7	7	7
Halocarbons													

\* Metals: ICPE screen (25 metals) SW 3005/6010

Arsenic (AA) SW 7060

Lead (AA) SW 3005/7421

Mercury (AA) SW 7470

Selenium (AA) SW 7740

\*\*Include one trip blank with each shipment of halocarbon samples to the lab. Seven trip blanks are authorized. If you will exceed this number, contact the PD.

Prior to the start of the pumping test, an 8 to 12 hour step test will be performed. This test will be used to establish the optimum pumping rate for achieving the desired drawdown in the pumping well. Data from the step test will allow preliminary determination of the number and locations of wells which can be productively monitored during the formal pump test. In addition to the step test, it is anticipated that background data will be collected electronically prior to the test for a period of up to seven days. Collection of background data will document how changes in atmospheric conditions (primarily barometric pressure) might affect the water table.

A four-inch submersible pump will be used in both the step test and the pump test. The pump will be powered by a portable gasoline generator. Step test pumping will begin when all well monitoring equipment is in place. The pumping rate, in gallons per minute, will be determined by timing discharge. Using a gate valve on the discharge hose, the pumping rate will be increased in steps during the test and the drawdown will be measured. The steps will be of sufficient duration to allow drawdown to stabilize.

Continuous monitoring of the drawdown in the pumping well and the rate of discharge will allow the determination of the rate at which the maximum sustained drawdown of the pumping well can be achieved. It will also provide information regarding the suitability of the pump and water disposal capacity to the desired rate. In addition, surrounding wells will be periodically monitored during the step test to determine the preliminary effects of ground-water pumping. These data will be used to determine the number of wells to be formally monitored during the 24-hour test.

The 24-hour pump test will be initiated after a sufficient period of time has elapsed to allow the full recovery of the aquifer. All required data from the pump test will be recorded on IRPIMS Pump/Recovery Test Data Collection forms. At the start of pumping, discharge will be monitored continuously until the desired pumping rate stabilizes. Because drawdown is more rapid at the beginning of the test, electronic recording of water levels in

the pumping well and surrounding wells will be in a logarithmic progression. Hand monitoring, as necessary, will also be at more frequent intervals during the early stages of the test. During the test, pH, conductivity, temperature and the visual characteristics of the discharge water will be recorded at regular intervals. In addition, the pumping rate and drawdown of the pumping well will be periodically checked to ensure consistency throughout the test, as wells will typically show a slow decline in discharge with time as drawdown increases.

Electronic data logging equipment will be periodically downloaded by hand during the test. This will allow the construction of time-drawdown plots, or hydrographs, in the field for all wells being monitored during the test. These plots will be used for preliminary determination of aquifer characteristics. Discharge water from both tests will be pumped temporarily into a holding tank to allow observation of water characteristics and recording of water quality data. Pending approval of the base POC, it is proposed to discharge water from the holding tanks, directly to the storm water sewer system.

At the conclusion of the 24-hour ground-water pumping, well monitoring and observation will continue so that the effects of ground-water recovery can be recorded. Recovery data will be included on the hydrographs for each well. Data from the aquifer pumping test will be used to calculate hydraulic parameters for the Upper Zone.

#### A.7 REPORTING

In addition to the required monthly R & D Status Reports, the following deliverables will be produced in accordance with the schedule indicated in VI DELIVERABLES of the Statement of Work, as amended for Mod 4:

- Decision Documents - for each site/area for which a finding of NFA or a preferred remedial alternative can be identified.

Format is specified in USAFOEHL/TS Handbook, Section 3, Version 3.0.

- Informal Technical Information Report (ITIR) - to include results of all new Stage 2 analyses. Format is specified in USAFOEHL/TS Handbook, Section 8, Version 3.0.
- Site Characterization Report - for Flightline Sites 4, 5, 10, and 12 in terms of delineating the extent, identification of potential sources, and impact of the TCE and chromium plumes on base.
- Letter Report - critique of Hargis and Associates, 1989 report, with special emphasis on their contaminant plume findings as they impact Carswell AFB.
- RI/FS Report - incorporate new results into IRP RI/FS Stage 2 Final Draft (April, 1988) to produce third and fourth Drafts, and Final IRP RI/FS Stage 2 reports.



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